Shorai BMS01 User's Guide

Rev.032015

Battery Management System for LFX Lithium-Iron Batteries

See http://www.shoraipower.com "Support" tab for video and extended photo battery install guides, and FAQ for information on charging and other topics.

LFX BATTERY CAUTIONS

- Do not short battery terminals together!
- Remove all jewelry (ring, bracelet, necklace, watch, etc.) before working near batteries or chargers
- Do not short the 5-pin BMS port
- Attach ONLY Shorai Chargers to the BMS port
- Do not open or allow damage to the battery case
- Keep batteries away from pets and children
- **Do not allow LFX discharge below 13.0V resting**
- Fully discharge LFX battery before disposal/recycle (connect a 12V bulb until light is out, for example)

BMS01 CHARGER CAUTIONS

- BMS01 are for charging and storage of Shorai LFX Lithium-Iron batteries ONLY!
- Connect BMS01 AC Input plug to 100V~250V 50/60Hz single-phase AC wall socket, only.
- Never allow the charger to become wet. Keep out of snow, rain, and highly humid environments
- Chargers damaged by impact, moisture, or any other cause must NOT be used
- Use the built-in retractable hook to hang BMS01 off the floor whenever possible
- Keep 5' (1.5M) minimum clearance from flammables around battery or vehicle during charge or store mode
- Keep charge output cable connectors clean and dry. Apply an anti-corrosion electrical grease if in salty, humid, or wet environments
- Replace charge output cables after 1200 connect cycles
- BMS01 has 6V and 12V Output Ports. Only one type (12V OR 6V) may be used at a time. Again, only ONE output port can be cabled at any time.

BMS01 BOX CONTENTS

- Shorai BMS01 with Charge & Store modes
- AC input cord (US, EU, or UK version per sales location)
- Battery Charge Cables for 12V
- Charge Extension Cables for 12V
- This User's Guide

SETUP

Remove the BMS01 charger, AC Input cord, and the two charge cables from the packaging, and attach the AC Input power cord to the AC port shown below.

Note that the small 3-pin port to right of the AC Input is reserved for factory diagnostics, and should never be used, modified, or have anything attached to it.

The BMS01 is supplied with a long and short cable for 12V LFX. (cables for the 6V LFX batteries are sold separately). The longer cable can be permanently attached to the battery via its 5-pin connector (which is labeled "to battery"), and tied off at a convenient location on the vehicle, where it is protected from water and damage. The opposite end of the cable can be plugged directly into the BMS01 charger output port, if it is long enough to reach. If extension is required, the shorter cable in the set can be used for that purpose. The 12V/6V charge ports are shown below.

At this point you should have the battery charge cable connected to the battery BMS port, and the AC input cord connected to the charger. Now insert the AC plug into an appropriate AC wall socket. Whenever possible, use the charger's retractable hook to hang the BMS01 above the floor, in a location which allows easy access to the battery charge cable. Now plug the battery charge cable into the correct LFX charge output port (or into the extension cable).

The charger will "beep" a few times when the LFX battery is connected to the charge cable, and you should see both the yellow Store and green Charge LED on solid, indicating that the charger is ready for input. After pressing either the store or charge button you will hear a "triple" beep which indicates the charger is active. **Note- If a button is not pressed within 30 seconds the charger will power down. To turn the BMS01 on, press the charge button.**

The photo above shows the two operation buttons, and their corresponding LED indicators.

Store Mode - The BMS01 Store Mode is optimized to maintain Shorai LFX batteries for best lifespan and performance. Once Store Mode has been started, the BMS01 can remain attached to the LFX battery and wall power indefinitely, until the vehicle is to be used again. When Store Mode is activated, the BMS01 will either charge or discharge the LFX battery until an approximate 80% charged state is reached. At that point the BMS01 will monitor capacity, and when ~60% state is reached will re-charge to ~80% level, and so on. This range is ideal for lithium-iron storage. **LFX crank vehicles strongly even if well below 60% capacity state, however for the best performance and longest life span press the charge button to fully charge the battery before use.**

Charge Mode - The BMS01 charge mode charges at 2A peak rate, while balancing the internal LFX cells and performing battery diagnostics. Charge completion will typically occur within 30 minutes to 4 hours, depending on the size and state of the battery at charge start. When the battery voltage reaches ~14.4V the charging process is complete and the BMS01 unit will beep several times, the light will turn solid green, and then power off within 30 seconds**. Important- after charging is complete disconnect the charger from the battery to help maintain a high state of charge.**

Status	LED Indicator	STORE LED	CHARGE LED
Ready Mode[1]	Both Solid		
Charge Active[2]	Flashing Green		
Charge Complete	Solid Green		
Store Active	Flashing Yellow		
Store Maintain	Solid Yellow		
Error Condition[3]	Flashing Together		

[1] When the AC power cord is first plugged to AC power, each LED will turn on solid, to indicate charger READY for input. Note- If a button is not pressed within 30 seconds the charger will power down.

[2] When the LFX battery is above 50% capacity at the START of CHARGING, only the Green LED will flash. **However, if below 50% capacity at the start of charging, the yellow and green LED will flash alternately.** This warns you that the battery has been allowed to drop low in voltage, and you may need to charge more often, or use Store Mode while parked long term. **To correct this condition press the charge button; a "triple" beep indicates the charger is active and the lights continue to alternate.** Once the battery reaches 50% capacity the charger returns to flashing green only.

[3] Errors are indicated by a flash/pause sequence of both LED **flashing together**. An alarm buzzer may also sound until error is corrected or power off:

- **1 flash/pause =** Internal input voltage error. Check that AC power is in range and properly connected. Try another outlet.
- **2 flashes/pause =** Polarity error. Not typical.
- **3 flashes/pause =** Open Circuit. Charge cables not properly connected, broken, or worn. Inspect and/or try new cable set.
- **4 flashes/pause =** Battery/Cell voltage error. Cell variation issue, use the store mode for 24hrs, then charge to correct issue.

BMS01 Specifications	
Charge Current / Wattage	2A peak / 30W max
Charge Type & Voltage	CC/CV, 14.4V terminal
Indicators	1x Yellow & 1x Green LED, Buzzer
Input Voltage	100V~250V , 50/60Hz, single phase AC
Weight (w/o cables)	720g (1.58 lbs.)
Dimensions L x W x H	11.4 x11.4 x 3.8cm (4.5 x 4.5 x 1.5")

WARRANTY (North America)

Shorai Inc. offers a Limited One-Year Warranty for Shorai BMS01 chargers and BMS01 accessories, solely for defects in material and/or workmanship.

All warranty claims for North American sales are handled directly by Shorai Inc. (USA).

See http://www.shoraipower.com/rma for online submission of warranty claims, and Return Merchandise Authorization (RMA#) assignment.

Please do NOT return any product without an RMA#, or before Shorai has contacted you to perform some simple diagnostics. In many cases issues can be solved prior to return.

Conditions NOT Covered

- Physical Damage occurring after purchase (impact, water/moisture/salt corrosion, etc)
- Improper AC input voltage or phase
- Connection to other than Shorai LFX batteries
- Short circuit of output ports

Returns MUST be accompanied by:

* A copy of Original Dealer Receipt (or Shorai Order ID#)
* Shorai-Issued RMA#

Returns without Receipt and/or RMA# can only be replaced at 30% discount from Shorai MSRP (suggested retail) price, plus return shipping charges:

Products found NOT defective after in-house testing at Shorai can only be returned to customers, at their expense for shipping. Customers are responsible for paying initial shipping charge to return any warranty-claim BMS01. Shorai Inc. will pay shipping on replacements returned to customers, except those without copy of receipt and/or RMA#. **Note that for any Shorai product which is purchased from a North American dealer (or Shorai Inc. USA) and shipped to an end user outside North America, ALL shipping costs related to warranty claims are the responsibility of the user.**

NON-WARRANTY RETURNS

Any merchandise in "**new**" condition and **originally purchased via the Shorai website** may be returned to Shorai Inc within 30 days of purchase. For "as new" returns to other sellers, please consult your seller for their terms.

Merchandise must be accompanied by a Return Authorization Number, copy of receipt or order number, and all original packaging in "new" condition.

Refunds will be granted less the original shipping cost. A restocking fee may be assessed - or refund entirely refused - in case the product or packaging is damaged, depending on severity.

SHIPPING DAMAGE

Any item damaged in transit must be reported to the SHIPPER IMMEDIATELY upon opening of the package, and also Shorai Inc. All original packaging must be retained until further notice. Shorai will respond with instructions ASAP, after consultation with the shipping agent.

Thank you for choosing Shorai! We hope and expect that you'll be pleased with the performance of our products, for years to come. Do be sure to contact us if you have questions, problems, or suggestions; we're here to help.

SHORAI INC.
16020 Caputo Drive Suite 100
Morgan Hill, Ca 95037 USA
TEL: 408-720-8821
FAX: 408-720-1537

order/return inquiries: **shop@shorai.org**
technical questions: **racetech@shorai.org**